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United States Department of Agriculture

Bureau of Agricultural and Industrial Chemistry

ANNUAL REPORT ON MANAGEMENT - 1953

In order that this Bureau may derive maximum benefits from the Management Improvements developed throughout the past fiscal year, a consolidated report has been prepared for the use of each Regional Research Laboratory. Some of the improvements reported might be applicable in more than one Region. If further information is desired on a particular improvement feel free to write to the originating laboratory through your director.

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U. S. DEPARTMENT OF AGRICULTURE

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A. Improved Techniques as Aids in Solving Research Problems and Conserving Manpower:

1. High Pressure Steam Kettles in the Laboratory

In studies of the heat reactions of maple sirup, it was necessary to use equipment having good heat transfers but without danger of scorching and which could be controlled within close temperature limits. Further, it had to be adaptable for use with small amounts of sirup to conserve material.

The problem was solved through the use of small steam jacketed kettles of 1 and 4 quart capacities commonly used in the restaurant trade but not usually considered chemical research equipment. These kettles have been installed in the low form standard chemical hoods to prevent steam escaping into the laboratory. The kettles have been equipped with reducing valves to obtain steam pressures of less than 1 or more than 35 p.s.i. with their corresponding temperatures. The kettle jackets are also connected to the cold water line so that the material being cooked can be quenched whenever necessary.

These kettles have made it possible to carry out investigations that would have been impossible with the conventional beaker-hot plate or flask-glascol heater combinations. Their use has been extended to other research investigations including that on honey. (E)

2. Device for Pressure Filtration

To speed up the numerous filtrations through sintered glass filters necessarily performed in connection with light scattering, osmotic pressure and viscosity studies on synthetic polymers and proteins. The filtrations are conventionally performed in glass apparatus, using a vacuum. They are somewhat hazardous, often troubled by fluctuations in the degree of vacuum, and often accompanied by concentration changes due to evaporation and loss of material due to foaming.

A simple metal apparatus was devised, incorporating a sintered glass funnel as the filtration medium, and supplying the needed pressure differential by means of compressed air rather than vacuum. Several of these filters were built and are in constant use. They are considerably safer than the vacuum filters and enough faster that substantial savings in chemists' time are being made by using them. (E)

3. Isolation and Identification of Fruit Components

In the research on the prevention of enzymatic browning in fruits, one of the important problems was to isolate from the fruit and identify the chemical constituents that cause the browning. These constituents, broadly known as tannins, are present in the fruit in very small amounts and are extremely difficult to separate from other fruit components and from each other. Preparation of a pure sample of a tannin in an amount sufficient for chemical characterization requires the use of a multiple sol-

vent extraction procedure which is very tedious and laborious. Several weeks of a chemist's time are required for each fruit sample to conduct this extraction by ordinary chemical methods.

It was determined that the multiple solvent extraction could be performed by means of a newly developed countercurrent extraction technique. An apparatus for this purpose has been acquired together with a "robot" which performs the necessary operations in an automatic manner. The capacity of this machine is such that in one experiment of about 24 hours' duration (operating day and night) it performs about 20,000 individual extractions and separates a fruit preparation into several chemical components or chemically similar groups of components. This machine not only effects a tremendous saving in professional manpower and in time, but it makes it possible to undertake experiments which would be otherwise impossible to carry out. This machine, which was originally acquired specifically for the work on enzymatic browning, has been employed at the Bureau's Laboratory with great success in other studies such as studies of the identification of carotenoid substances in orange juice and purification of antibiotics, and promises to be equally useful for research planned for the future. (W)

4. A Rapid Method for the Determination of Pectin

In the study of the factors responsible for firmness in berries and fruits, and in the study of the viscosity of purees, it was necessary to make a large number of analyses for pectin. The classical method of analysis required several extractions of the fruit or pulp with hot solutions and the analyst was limited to handling two samples at a time. The extraction was followed by two precipitations and the slow filtration of the jelly-like precipitates. Also, an appreciable amount of pectin was necessary for the analysis which required the research worker to prepare large samples.

By determining the proper conditions for the use of the newly developed calcium sequestering reagents and commercial enzymes, a procedure was developed for the extraction of pectin at room temperature. The procedure is simple and groups of 20 samples can be extracted at one time. The pectin extracts filter rapidly. The pectin is determined in the filtered solution by a reaction with carbazole which gives a color that is proportional to the pectin present. By this new procedure, which eliminates multiple extractions and slow filtrations, a chemist can make 10 times as many pectin determinations as was possible using the older method. The new color procedure is equivalent in accuracy to previous methods and samples as small as a single raspberry can be analyzed. Research problems requiring pectin analysis have been greatly speeded up by the use of this new method. (W)

5. Rapid Determination of Carbohydrates and Similar Substances

In a recently developed method for determining moisture in fresh fruits and vegetables it was shown that dichromate oxidizes the oxidizable

solids very reproducibly and rapidly, without external heating, by utilizing the heat of dilution of concentrated sulfuric acid. The possibility of devising simple analytical procedures, requiring minutes instead of hours, made the extension of the study of this reagent as applied to various pure constituents of fruits and vegetables, and other pure substances, appear worthwhile.

A large variety of pure substances was studied: 11 sugars, potato starch, 4 celluloses, 3 amino acids, 20 aliphatics, and 5 aromatics. It was found that all substances whose carbon atoms are each attached to one or more oxygen atoms, or have double bonds, which includes practically all carbohydrates and many aliphatics and aromatics, are quantitatively, within a few tenths percent, determinable with the reagent. The method requires no special equipment or skill and provides an answer in five minutes, formerly requiring hours and/or expensive apparatus and skilled manipulation. Such analyses as pure sugar content of a syrup, dextrose + levulose content of a syrup, percentage of dextrose or levulose, etc., in otherwise pure sucrose, proportion of oxalic or formic, in otherwise pure malonic, tartaric or citric acids, and many similar combinations, or amount of celluloses in a moist, ash-containing sample, are all five-minute jobs for tenths-percent accuracy, using the new method. (W)

6. Technique for Maintanance of Culture Collection

The Culture Collection Section is confronted with the problem of maintaining, in pure culture, approximately 7,000 living microorganisms. Many of these have already become important as the stock cultures upon which such major fermentation industries as penicillin, citric acid, riboflavin, and dextran are based.

Maintenance of the culture collection has, in the past, been handled by transferring the culture to several fresh nutrient agar slants every six to eight months, requiring a great many man hours for the preparation of 14,000 to 21,000 agar slants each year. This method has other disadvantages: (1) Possibility of variation with each succeeding generation. (2) Possibility of contamination with each transfer and during storage. (3) Large storage space required.

A program of lyophilizing has been perfected and nearly all the cultures in the collection - molds, yeasts, and bacteria - are preserved by this method.

The process consists of suspending cells or spores of a culture in sterile blood serum, rapidly freezing, and drying under vacuum in small ampules which are then sealed, and stored in a refrigerator.

Many of the cultures have been maintained for ten years without apparent loss of viability. This study is still in progress and it may be possible, after future viability checks, to depend upon lyophilized preparations for periods much longer than ten years.

In addition to greatly prolonging the viability of cultures, lyophil preservation has certain other advantages as follows: (1) Strain variation is minimized through infrequent recultivation. (2) Possibility of contamination during storage is eliminated since the preparations are sealed in glass ampules. (3) Preparation of multiple tubes provides a uniform source of inoculum over an indefinite period. (4) Small size of finished preparations conserves valuable storage space. (5) The cost of maintaining the culture collection is greatly reduced. (N)

7. Search for Source of High-Amylose Starch

In the search for a cereal grain with starch of high amylose content, it was desired to examine as many samples as possible from a maximum number of sources. Most available samples were found to consist of only 10 to 30 kernels each. They were chiefly from foreign countries or were new crosses just developed by plant breeders. In either case, increase of the amount of material available would involve time and labor for growing the grain. The conventional method for determining amylose at the time the work was started involved separation of the starch by a method requiring a minimum sample weight of 100 grams. The starch was defatted and its moisture content determined and calculated to the moisture-free basis. Total time consumed per sample was about 1.5 man-days.

A method was devised which not only permitted a study of nearly 1,000 samples, including material from world-wide sources and from special breeding programs, but which permitted the worker to use as few as 10 corn kernels or 25 wheat kernels. Experiments showed that protein did not interfere with the amylose determination. The endosperm was therefore separated from germ and bran, finely ground, and defatted. Its moisture and protein contents were determined. Its amylose content was then determined and calculated to the moisture- and protein-free basis. The total time consumed per sample was reduced to about one man-day or one-third less than the original method and represents a saving of nearly 500 man-days. (N)

8. Improved Methods for Characterizing Dextrans

In the research program on the development of a blood volume expander from dextran to replace plasma, it was recognized that the molecular weight of a dextran designed for clinical use was one of the most important criteria for its suitability. Therefore, a rapid, reliable method for molecular weight determination was needed to guide research on the development of economical processes for the production of clinical dextran. The only thoroughly established physical method for molecular weight determination at the inception of the program was the osmotic pressure method which required at least one day of an operator's time for the completion of measurements on a single sample.

Potentially more rapid in its application was the recently introduced light-scattering method which had become practical as a result of the design and construction by the Bureau of light-scattering photometers for use in other phases of its research program. Preliminary measurements on dextran solutions, however, showed that, as ordinarily applied, the light-scattering method gave erroneous results caused by inadequate clarification of the dextran solutions. Thorough investigation of clarification methods on samples whose molecular weights were known from osmometric measurements led to the development of procedures whereby adequate clarity of clinical dextran solutions could be attained rapidly. Simple criteria for adequate clarity were then developed. With these methods it became possible for an operator to determine the molecular weights of three to five samples per day, representing a considerable saving of time compared to the osmotic pressure method. Simplifications introduced into the viscosity procedure made possible a molecular weight characterization adequate for many purposes of up to 25 samples per day by a single operator. Thus time available for work was multiplied 3 to 5, and in some cases, 25 times. (N)

9. Rapid Recovery of Valuable Product in Process Liquors

The Department of Defense requested the Bureau to develop a process for the recovery of a drug from dried plant material. Progress in the laboratory was considerably delayed by the length of time required to analyze the process liquors for the drug. The analysis required two days, while the process experiments could be completed in one day. Thus, approximately two days elapsed before another experiment could be designed based on the results of a previous run. A rapid method of analysis was needed not only for the extracts but to determine the minimum breakthrough during the ion-exchange adsorption process.

Molecular weight determinations showed that the drug undergoes rapid and nearly complete oxidative dimerization when treated with an alkaline solution. By a judicious choice of conditions of reaction, the effect of interfering reducing substances such as sugars can be minimized. A simple, volumetric micromethod of analysis was devised which required only 10-30 minutes for completion. By comparing the analytical data with those obtained by the lengthy procedure, correction factors have been calculated for the various process liquors. The method speeds up the research and reduces the cost. It is invaluable for control purposes and is now being utilized in the pilot-plant study of the process. The new method permits the use of microamounts and greatly reduces the number of experiments for this phase of the problem. (N)

10. Device for Simultaneous Measurements of Strength and Elongation of Fibers

In measurements of the strength of bundles of cotton fibers by the existing methods several variables, due to existing conditions, in-

struments, and operators, are responsible for considerable non-reproducibility in the test results. In order to maintain a uniform level of testing, it has been necessary to make bundle strength measurements on samples taken from a uniform control at frequent intervals and apply corrections.

A new instrument, known as the Stelometer, has been developed which controls the major error variables in testing caused by test conditions, instrument characteristics and operator differences. It registers the strength and, along with this, without any additional labor, the elongation of the fiber bundle at the time of break. Control of instrument and operator variables has considerably reduced the number of tests of the check sample required to maintain a uniform level of testing. Furthermore, it provides a measurement of a physical property of fibers which is not normally evaluated by the existing testing methods and does this without increasing the time required to make the strength test. The efficiency in testing is improved through the reduction in the number of control tests required and through the increase in amount of useful data secured. (S)

11. Improved Automatic Yarn Tester

Research studies of cotton yarn properties usually require 100 to 200 determinations for breaking strength and elongation at break for each sample of yarn tested. With the IP-2 tester, which is the usual tensile tester employed for singles yarns, an operator working steadily can average about 300 to 350 tests per day, or 100 tests on each of 3 to 4 samples. This is far below the needs for the various projects requiring such tests. Since experimental yarn products are tested regularly, a considerable amount of effort is expended in evaluation.

A Uster automatic yarn tester, manufactured in Switzerland, has been procured for use in place of the IP-2 yarn tester to speed the production of test results, to make better use of personnel time, and to gain facilities by which more test information can be obtained. This tester automatically makes 20, 40, 60, and so on up to 200 tests for breaking strength and elongation; tallies on counters the total breaking load, the total elongation and the number of individual tests made; records on chart paper the individual breaking strength and elongations as bar graphs; and collects the yarn tested for subsequent weighing to determine the yarn number. At the same time, it provides information on the frequency distribution of the breaking strength values from which the standard deviation and the coefficient of variability can be calculated readily. One instrument averages between 700 and 800 tests per day and requires about one-half of an operator's time in contrast to half as many tests and twice as much operator time for the IP-2. This provides increased yarn testing facilities much needed to meet the requirements of the research program of the Laboratory and, on the basis of the number of tests previously made with the IP-2 tester, savings of approximately $3,000 a year. Those who use its test results also benefit in that no further calculations on their part are required. (S)

B. Reducing the Government's Share of the Cost of Research by Cooperation with Industry

12. Preservation of Carotene in Alfalfa

Alfalfa is dehydrated for the primary purpose of producing a high vitamin A feedstuff but the vitamin A potency (carotene) is lost during warehouse storage. Studies at one of the Bureau's laboratories showed that this loss could be minimized by the application of oil-soluble antioxidants. However, determination as to how this could be done on a practical operational scale would have required leasing green alfalfa fields, costly cutting, chopping and hauling equipment, a rotary drier and warehousing facilities for extended storage studies. None of these processing facilities were available and because of the climatic conditions plus urban location of the laboratory green alfalfa in quantity could not be obtained. Furthermore, acquisition and operation of all the physical facilities required would have been prohibitive costwise.

Arrangements were made with the largest feed cooperative in California whereby personnel for the Bureau's laboratory were allowed to make successive trials at two of the highest producing dehydration plants in the country. Full-scale tests of antioxidants, oil carriers, and metering equipment were made plus warehouse storage studies of the experimental product. In addition, the cooperative studied the biological effect of selected samples by the use of chick feeding experiments in their laboratories. The initial cost, installation and operating expense of thousands of dollars worth of equipment was avoided. Manpower requirements were held to a minimum; but more important, a process was taken from the laboratory, and after a few preliminary tests, was established as a feasible, economically sound procedure. The operation is simple enough that any commercial dehydrator can adapt it to his production line with a minimum of cost and development work. As a result the practice is rapidly becoming general in the industry. (W)

13. Redetermination of the Sachs-Le Docte Volume to be Used for the Analysis of California Sugar Beets

The sugar beet grower is paid by the beet sugar processor on the basis of the amount of sugar his beets contain at the time of delivery. Sugar beet payments under the "Sugar Quota Act" are disbursed by the Production and Marketing Administration to the grower on the same basis. The method of analysis of sucrose in beets to establish the level of payment has been questioned by sugar beet growers in California. The basis for the method has been reexamined by Bureau chemists and proved to be sound; however, the volume of solution (the Sach-Le Docte volume) to be used needed further investigation. Because of the variation of the sugar content on individual beets, at least 1500 determinations of this volume had to be made with at least 500 samples of sugar beets to establish a reliable estimate of the mean volume. The number of samplings of 10 beets per sample, the storage of the samples and replication of the analyses would have required expansion of the staff and purchase of special equipment for the work.

A committee was formed comprised of representatives of the California beet processors, the California Beet Growers Association, and the Bureau of Agricultural and Industrial Chemistry. Through this committee, arrangements were made for factory chemists to determine the volume of solution required for analysis each day (in some cases twice a day). Once each month during the season, at each factory, additional samples will be frozen for check analyses by Bureau chemists. This procedure will permit analysis of the entire 500 samples with no increase in the Bureau's personnel or equipment. (W)

14. Microbial Feed Supplements

The use of antibiotics in practical feed rations for poultry and swine has rapidly attained a position of considerable economic importance. In connection with the search for and development of better and cheaper antibiotic feed supplements, which is now in progress, it is necessary to conduct extensive feeding trials with chicks. Conduct of the feed evaluation phase of this work in a Bureau laboratory, however, is impracticable because it would not only involve the acquisition of costly feed testing facilities and maintenance of livestock, but would also require the employment of additional personnel. Production of large lots of promising new antibiotic cultures sufficient for repeated testing which is necessary to inspire confidence in the value of a new product is likewise impracticable in the laboratory in which this line of research is being pursued.

The voluntary cooperation of several interested industrial organizations having appropriate testing facilities, including a feed supplement dealer and a feed manufacturer, was enlisted for the preliminary feed evaluation work on various antibiotic cultures produced in the Laboratory. Subsequently, a contract was negotiated with an industrial research foundation for the conduct of more comprehensive feeding tests. A yeast products manufacturer cooperated by making available large-scale fermentation equipment and facilities for producing large lots of selected bacterial cultures previously found to have special promise. As a result, progress in the screening and evaluation of many different bacterial cultures has been greatly accelerated and the cost to the Federal Government for this work greatly reduced. (W)

15. Utilization of Sugarcane Bagasse for Manufacture of Fiber Shipping Containers

For several years during and since World War II, there has been a world shortage of pulp for the manufacture of paper and board products. Shipping containers, container boards, and methods of packaging assumed considerable importance during World War II which has been emphasized even more since 1945. This has caused the industry to consider the use of bagasse pulp as a raw material for the production of corrugating medium and liner board.

The new mechano-chemical method for the pulping of straw and bagasse developed by the Northern Laboratory has aroused considerable industrial interest, but industry hesitates to install new processes unless proven on at least a small industrial scale.

In small-scale studies, the Laboratory had already developed methods for the production of pulps from whole and depithed bagasse to produce a corrugating medium or liner board of commercial quality. However, personnel were lacking to improve the methods on even a laboratory scale, and the Laboratory was in no position to undertake large-scale pilot-plant trials required to more fully demonstrate the process because the specialized equipment was not available here and its technical personnel was already engaged on other important research.

In undertaking this problem, the Northern Laboratory solicited the aid of various interested groups who could contribute toward its solution. A memorandum of understanding with the Hawaiian Sugar Planter's Association provided the services of three men who worked almost a year at the Laboratory under the supervision of our chemical engineers, conducting preliminary research to improve the methods and develop pilot-plant data.

The Hawaiian Sugar Planter's Association, the U. S. Sugars Corporation, and Godchaux Sugars, Inc., cooperated in furnishing several tons of sugarcane bagasse collected from plants in Hawaii, Florida, and Louisiana for use in this work. The Laboratory cooperated with the Southern Regional Research Laboratory regarding their studies on the utilization of sugarcane by-products. They also made informal cooperative arrangements with several firms for the loan of specialized equipment and consultation and advice on the wet screening of bagasse, dewatering of pith, vacuum filtration of pith, and other technical problems. Some of the firms which cooperated on this problem were: Bird Machine Company, Link-Belt Company, Jackson and Church Company, Bauer Brothers Company, and General American Transportation Corporation.

When the Laboratory processes were ready for large-scale semi-commercial testing, a research contract was negotiated with the Research Foundation of the State University of New York to process large quantities of sugarcane bagasse into pulp, manufacture the pulp into corrugating and liner shipping containers of various sizes. This organization had the necessary large-scale specialized equipment for pulping and paper manufacture including a 40-inch paper machine worth approximately $250,000.

Following the completion of this contract, another informal memorandum of understanding was arranged with the Hawaiian Sugar Planter's Association to have the experimental shipping containers tested by commercial testing firms and to provide for actual use of these containers by industrial companies for the shipment of their products.

A local firm also used some of the shipping containers in large-scale railroad shipping tests.

Thus by one coordinated attack, utilizing the combined efforts of various organizations and firms having the necessary pilot-plant facilities, specialized equipment and experienced personnel, successful solution of the problem was accomplished in a space of a few months without purchase of costly equipment or a drain on our manpower time. (N)

16. Liaison with Armed Forces

At the request of the Armed Forces the Bureau has undertaken research on an urgent defense project because a group of scientists at one of the Regional Research Laboratories is highly skilled in the basic techniques required for the work. Much classified information of a related nature had already been developed at the army installation with which we are cooperating. It was apparent that our program could be planned and initiated much more expeditiously by our acquiring the necessary background information directly from the investigators.

A key man, who is an expert in the basic field of science involved in the project, was detailed to act as liaison representative between the Laboratory and the army post for a period of 90 days for the purpose of obtaining first-hand information that would expedite our work and prevent duplication. As a result of his efforts (1) selected scientific reports, most of which are classified, were made available to the proper members of our Laboratory staff; (2) on the basis of these reports and other related information obtained in conferences, we were able to plan our part of the program much more intelligently; (3) our experimental work was initiated much earlier; and (4) our program will be expedited considerably as a result of the good working relations that were established with the technical men and with the managers of the project. (N)

17. Corrosive Action of Exhaust Gases from Alcohol-Water Injection

Conflicting information on engine cylinder wear with alcohol fuels made it highly desirable to ascertain the correct facts. However, it was found that the special equipment could not be fabricated in our shops and was not obtainable without considerable delay because it had to be constructed of special materials.

It was known that a large tractor manufacturer had just completed a very extensive analysis of Diesel exhaust gas using this type of special equipment. The Research Department of the company was approached and arrangements were made for the Government to use the specially constructed stainless steel condensers and auxiliary piping without cost. This enabled the research tests to be completed promptly at a considerable saving to the Laboratory, including approximately $1,500 for special research equipment. (N)

18. Gasoline Quality in Farm Tractor Operation

In connection with investigations of the use of alcohol-water injection to prevent valve sticking and burning in farm tractors, it was found that a complete analysis of the gasoline used by the farmer would assist materially in the interpretation of the results obtained and greatly increase the value of the results. There were sixty tractors operating in the program and since each sample required four separate analyses, it was estimated that an average of 400 analyses would be needed each month for a period of two years. Laboratory personnel were already engaged on other important research and could not undertake this additional work.

Arrangements were made between the Northern Regional Research Laboratory, the contractor, and a farmer cooperative which supplied the tractor operators with gasoline, for the contractor to collect the samples and send them to the farmer cooperative who hired another worker to make the analyses. Only occasional check samples were analyzed by this Laboratory, therefore, this additional work was accomplished cooperatively without hiring another employee to do this work. (N)

19. Alcohol-Water Injection in Super-High Compression Tractors

The recently successfully concluded test on alcohol-water injection in 50 farm tractors with compression ratios from 4.5:1 to 8:1 indicated that still higher compression ratios might increase operational efficiency still further. The results of such a test would be extremely important, and would cover a period of several months. A suitable tractor engine in the required compression and high-compression conversion equipment was required for these tests.

Through arrangements made with two tractor manufacturers, a tractor and the required high-compression conversion equipment was obtained for these tests. No charge was made for the loan of this equipment, and as a result, the Government saved approximately $1,000 in rental costs. (N)

20. Optimum Temperature for Storage of Sweetpotatoes to be Dehydrated for Food

To improve the quality of dehydrated sweetpotatoes for military use by relating the changes in chemical and biochemical properties of the raw material during storage and preparation for dehydration, with the palatability and nutritive value of the product.

One of the objectives of the investigation was to determine the effect of conditions of raw material storage on the acceptability of dehydrated sweetpotatoes. The temperatures of storage desired were 50°, 60° and 70° F. for periods up to 8 months. The Horticultural Research Department, Louisiana Agricultural Experiment Station,

which has excellent fruit and vegetable storage facilities, was asked to cooperate, and furnished storage facilities in which raw material was stored at no cost to SRRL during F.Y. 1952 and 1953. A total of 59 samples (32 of about 5-7 pounds each of material and 27 of about 50 pounds each) has been withdrawn from storage to date. Construction and operation of adequate, similar storage facilities at SRRL would have cost the Bureau thousands of dollars. In addition, LSU supplied the following analytical data on chemical changes in the sweetpotatoes during storage; (1) shrinkage, (2) moisture, (3) carotene, (4) ascorbic acid, and (5) sugars, without cost. (S)

21. Evaluation of Derivatives of Pinic Acid

In the Bureau's Southern Region an intensive program of research is under way to develop a practical low-cost method for converting turpentine into pinic acid -- a versatile intermediate of potential utility in the manufacture of several industrial products. Two important uses for which pinic acid derivatives should be evaluated were, as plasticizers or softeners in plastics, and in compositions for the production of synthetic fibers and films. For use as plasticizers the Southern Region was only prepared to make screening or preliminary evaluations. For use in fibers and films the desired laboratory investigations could have been conducted in the Southern Region, but in the end conferences with outside experts would have been necessary to appraise correctly the experimental data obtained.

The problem was solved by obtaining the cooperation of two companies which employ experts in the fields of plastics, fibers, and films. Under separate memoranda of understanding the Southern Region is furnishing the pinic acid and the two companies are making the desired investigations, and at no cost to the government are furnishing an adequate evaluation of the probable utility of different derivatives for the different uses listed. The saving made possible by this arrangement is estimated to be about $10,000. (S)

C. Personnel Management:

22. Establishment of New Employee Review Policy

Incident to the March 31 performance ratings the Bureau initiated during Fiscal Year 1953 a personnel review policy. Each supervisor at the time of the performance ratings was requested to make a comprehensive personnel review with each person for whom he has supervisory responsibility, this to include: (1) a review of the current official written description of the duties of the position and certification as to its accuracy, (2) a review of the employee's on-the-job performance, and discussion of the performance requirements of the position, (3) a review of the employee's qualifications and accomplishments, including additional educational attainments, and discussion of these with the next higher supervisor. This threefold review brings together into one operation those considerations required by the Performance Rating Act of 1950, the Whitten Amendment (Section 1310d of Public Law 253), and the Bureau's Career Program

and Promotion Policy Statement approved by the Bureau Chief December 21, 1950. As a further step to this plan the Chief of Bureau holds an annual personnel conference with each Regional Director for the purpose of reviewing the program planned by the Regional Director for the coming fiscal year in the development and advancement of members of the regional staff. This affords opportunity for the Chief of Bureau to be informed as to the potentialities for leadership of staff members and also to review the organizational pattern of the various divisions, sections and smaller field stations to assure appropriate organizational structure and balanced staff to achieve maximum research progress. (Washington)

23. Employee Advisory Councils

Three new Employee Advisory Councils were established in the Bureau during the fiscal year 1953, one each at the Eastern, Southern and Western Regional Research Laboratories. An Employee Advisory Council was set up in the Northern Laboratory, Peoria, Illinois, in 1951 to determine the effectiveness of such councils in a large research installation. Experience gained during the trial operation of the council at Peoria led to the conclusion that Employee Advisory Councils are especially desirable and beneficial from the standpoint of the Bureau and employees generally. The councils serve in an advisory capacity to the Bureau Regional Directors on matters of general interest and welfare of a significant number of employees. Council membership consists of nonsupervisory employees elected by secret ballot. (Washington)

24. Rockefeller Public Service Award

In February 1953 the Chief of the Bureau was notified that he was the recipient of one of the Rockefeller Public Service Awards designed to give special recognition to outstanding public service by civilians in the Federal Government. The Bureau Chief's intense interest in administrative management and the realization of its importance in the administration of federal programs encouraged him to apply for one of the Rockefeller awards with the intention of using it to attend the Advanced Management Program of the Harvard University Graduate School of Business Administration. The Chief of the Bureau was one of 11 federal employees so honored. The award carries a $6,000 stipend which will permit the Chief of Bureau to attend Harvard University this fall for approximately 3 months on leave without pay from his position in the Bureau. This invaluable opportunity which is being presented without cost to the Government should increase the effectiveness of the Chief of Bureau as a federal administrator of public research. (Washington)

25. Supervisory Training Program

A comprehensive survey was initiated during the latter part of the fiscal year with the assistance of the Office of Personnel, to determine requirements for and development of a Bureau supervisory training program with particular reference to the needs in relation

to research workers. This survey has now been completed and a report with recommendations is being prepared. Preliminary discussions on results of the survey indicate a wealth of valuable information which should provide a sound basis for a program of supervisory training in the Bureau. (Washington)

26. Training of Junior Chemists for Research Work

The group under discussion consisted, about a year ago, of 5 GS-5 chemists. They were working in the Steroid Assay Section of the Biochemical Division. This work had become streamlined and routinized, as explained in last year's Management Improvement Action. Their primary function was to take crude steroid fractions prepared by other groups in the sections and purify and characterize their constituents. After the steriod assay program was running smoothly (6-12 months after commencement of operations) it was possible to consider several important phases of the section's activities; (1) a large number of research problems were at hand, far too numerous for the two experienced chemists assigned to full time research (2) it was considered desirable and in fact essential to keep up the morale of the young men in the assay group since their operations, while calling for skill and judgment beyond that of a technician, were routine. Moreover it was doubtful if promotions to the next grade, GS-7, could be made solely on the basis of their assay work and we consider it essential for morale and enthusiasm to make promotions at reasonable intervals.

It was considered possible to solve the problems raised under (1) and (2) by combining the assay program with short term research problems. The group was called together and the situation fully explained. Stress was placed on the fact that the assay program must not be curtailed and that research and assay operations must be dovetailed. The program works as follows:

1. The problem is selected by the section chief. It must (a) be related to current line projects, (b) be of short term duration (1 week to 3 months on part-time basis), (c) if possible provide the individual with experience in new techniques and methodology.
2. Work is conducted under close but not rigid supervision of the section chief. Initiative is encouraged but not allowed to run wild.
3. Training in writing manuscripts and presentation of papers is given by the division and section heads.

This program has been highly successful as shown by the following facts. Over 3,500 plant samples have been received in 2½ years. Complete information on the first 2,000 has been compiled and the third thousand is nearly completed. Hence the assay program has not been curtailed. Group morale is very high. Proof of this is that there has been very little turnover at a time when these young men can attract higher salaries in industry and defense agencies.

The men are far advanced technically in comparison with their original background. Recently each of the five individuals in the groups under discussion presented a paper at a local American Chemical Society meeting. The papers received public praise from several outstanding leaders in steroid research including Professor Fieser of Harvard. The names of all of the men are appearing on publications reporting this research work. The program permits professional advancement -- all the individuals in this group have qualified for and been advanced to GS-7 positions. (E)

27. Training of Research Personnel in Specialized Fields

In order to effect an economy in operations and to strengthen its research program the Biologically Active Chemical Compounds Division was transferred from Beltsville, Maryland to the Eastern Regional Research Laboratory on September 15, 1952. Because a number of the division's employees did not transfer it became necessary to replace them with people who had no previous experience in the specialized chemical field in which the work of the Biologically Active Chemical Compounds Division falls. This required the training of lower graded personnel in specialized research as well as the training of high graded personnel in research and administrative management.

A number of discussions were held with these new employees during which the previous work of the Division on plant-growth regulators and alkaloids was reviewed in detail and all published information made available. Current lines of research were then discussed. The individual selected to head one of the research sections was then sent to the Northwestern Weed Control Conference which dealt largely with organic plant-growth regulators and herbicides. After this he visited the Bureau of Plant Industry, Soilsand Agricultural Engineering at Beltsville, Maryland which evaluates the compounds synthesized in the Biologically Active Chemical Compounds Division. This was done to allow the employee to gain first hand knowledge of the test conducted in the assaying of plant growth regulators and thereby learn something about the evaluation phase of the work. At all grade levels discussions have been held to make certain that the new employee was informed as to the objectives of the work, procedures to be followed and the type and caliber of work expected. As a result of this intensive effort there has been little lost time in the progress of the Division's research program due to the loss of trained personnel. (E)

28. Improving Performance of Maintenance Duties

Operation of a heating plant at one of the Bureau's laboratories involves a substantial amount of plant maintenance. While this type of maintenance work is frequently carried out in similar commercial plants by employment of oilers or other helpers to the firemen, in order to keep overhead personnel to the minimum, the Laboratory

heating plant has been staffed by only five firemen serving on rotating shifts with only one man on duty at any one time. In this situation, maintenance of the plant deteriorated since the work depended primarily on the initiative of each individual shift fireman.

The heating plant was divided into separate definite stations or areas for maintenance purposes, and one area assigned specifically to each of the firemen. Personal pride on the part of each fireman and the very positive designation of each individual's responsibility has resulted in a greatly improved standard of maintenance. (W)

29. Four Personnel Programs Combined in One

In conjunction with the annual Performance Review and Rating Program, the Northern Laboratory has found it very advantageous to conduct three other important personnel reviews at the same time. The four programs which are conducted simultaneously are:

1. Review of Employee Performance and Rating
2. Review of Employee Position Description and Work Assignments
3. Review of Employee Qualifications
4. Review of Employee Accomplishments for Consideration in Awards Program

These reviews were formerly made at different times during the year. The new procedure permits the coordination of important personnel administration activities, conserves a great deal of time and effort on the part of supervisors and administrative staff workers, and permits the employees to better understand the single program.

Employee understanding and appreciation has been strengthened by the preparation and distribution of a detailed explanation of the combined program and the specific objectives of each individual program. In addition, each employee received a brief summary-type leaflet giving the highlights of the combined program. The NRRL Employee Advisory Council assisted in the determination of the type of information which should be distributed by discussing the program with a cross-section of Laboratory employees and obtaining reactions and opinions.

Based on the success of the program during the first year of operation, and the general acceptance by employees and supervisors alike, it is believed that this program will increase in value each succeeding year. (N)

D. Building and Property Management:

30. Better Utilization of Research Materials

Because this country produces only about 15% of the vegetable tannins it uses, the search for new tannins is an important field of research.

The Biochemical Division of Eastern Regional Research Laboratory is screening a World-wide collection of plants for cortisone precursors. Of the more than 2,200 materials screened to date, 439 have shown tannin in greater or less amounts. If these tannin-bearing materials are not studied as potential sources of tannin, an opportunity to discover new and valuable sources of tannin may be lost.

The materials that react strongly for tannin are analyzed for tannin and their potential value as sources of tannin evaluated by the Hides, Tanning Materials and Leather Division. Thus a more effective use is being made of the cortisone precursor samples that are being collected and new potential sources of tannin are being investigated without the additional cost of sample collection. (E)

31. Adaptation of Research Equipment to Meet Current Research Needs

In connection with the transfer of the Biologically Active Chemical Compounds Division to the Eastern Regional Research Laboratory from Beltsville, Maryland, it was found that two side wall benches were needed in addition to those center and wall benches already in the laboratory space assigned to the division. These side wall benches were required to provide needed working space for research personnel. None were available in the building.

A survey of the situation revealed that while there were no side wall benches which were not already being used to their maximum capacity there was one center bench which was not being fully utilized. Investigation showed that this center bench could be successfully cut into two side wall benches. This solution to the problem will save the laboratory the cost of two new side wall benches and will result in maximum utilization of equipment on hand. (E)

32. Reducing Operating Cost of Heavy Duty Electrical Equipment

Increases in rates charged by utility companies as well as increases in the actual requirements of utility services have made necessary continuing reviews of utility service consumption. A food processing laboratory is equipped with a large 75 horsepower electrically operated compressor used to supply air to major items of food processing equipment. In addition, this compressor furnished air required for the continuous operation of a large number of temperature control instruments. Although the amount of air needed for control function is negligible, it was sufficient to cause the 75 horsepower compressor to operate intermittently on a 24-hour basis throughout the year. Not only did the intermittent start and stop operation prove harmful to the compressor, but the cumulative operating time was so substantial as to materially increase consumption of electrical energy.

In the process of analyzing of electrical service usage, it was found possible to supply air for the continuous operation of the temperature control instruments from an air supply for a number of continuous requirements in other areas of the Laboratory building. This change made it possible to restrict operation of the 75 horsepower

compressor to occasions when air was required for actual processing operations and reduced the average operating time of the compressor to approximately 25% of the former usage. (W)

33. Modifying Normal Operations to Meet Emergency Situations

In July, 1952 one of the major facilities of the Bureau, a food processing laboratory, was severely damaged and made inoperable as a result of careless use of a cleaning acid by a painting contractor performing a clean-up operation. The acid attacked not only paint and ordinary metal surfaces of the laboratory, but severely attacked critical stainless steel surfaces of food processing equipment, copper windings of electric motors and parts of delicate control instruments. Upon discovery of the damage on a Friday evening, the contractor indicated no understanding of the progressive nature of the corrosion. Therefore, an immediate decision was made to mobilize a large portion of the laboratory staff and methods to neutralize the acid were determined and carried out on an emergency basis over the weekend. While this prompt action neutralized action of the acid itself, the stainless steel surfaces had been pitted to an extent which made the equipment inoperable for food processing, and further, the pitting of itself created a secondary deteriorative condition since the corroded surfaces of themselves would promote slow, but continuous progressive deepening of the pitted areas.

Since the food processing laboratory and its equipment were vitally required for conduct of the major portion of the laboratory's work, it was essential to either devise a means of passivating the continuous corrosion and polishing and otherwise restoring the equipment to operable condition, or to contemplate the complete replacement of approximately $300,000 of equipment. This latter alternative, due to the delay which would be involved in fabricating specialized equipment, was intolerable since it would jeopardize the effectiveness of a major portion of the scientific staff for several months, even if the cost were not prohibitive.

The painting contractor, through his insurance carriers, was pressed to take steps to passivate the corrosion condition and to restore the equipment and plant into immediate operating condition. After several days, it became apparent that the workmen and metal artisans engaged by the contractor for this purpose were making no constructive progress.

The potentialities of the Laboratory staff were carefully considered, and all incidental skills of the various workers, which would be helpful to carrying out restoration of the plant, were ascertained. Experiments were quickly made on a variety of all known metal treating products, and a method for passivating the corrosion was devised. Similarly, information was developed and experiments conducted on the best method of polishing the stainless steel surfaces and other-

wise restoring damage. A general plan was developed for assignment of all available mechanics and other suitable Laboratory personnel for a large scale, renovation operation, entirely by the Laboratory staff. The operation was given over-riding priority throughout the Laboratory with the result that within a period of a short time, the maximum achievable restoration had been attained and the entire facilities of the Laboratory once more placed into effective operation. (W)

34. Critical Study of Refrigeration Facilities

Since construction of one of the Bureau's laboratories in 1939, the changing program over a period of years has resulted in need for more and more refrigerated facilities of a wide variety of design ranging from refrigerated rooms similar to commercial warehouse space to refrigerated space of highly unique and specialized design. Major portions of the refrigerated facilities had, during the course of twelve years' use, developed severe operational deficiencies. As a result, there was an ever increasing number of problems concerning maintenance, operation, and conflict of use.

A committee was appointed from the Laboratory staff with representation from the using research divisions, the officials primarily responsible for the actual operation of the refrigerated plants, and including personnel whose research background had included design of specialized refrigeration. Investigation was undertaken of:

1. Refrigeration requirements
2. Need for reconditioning or replacing equipment
3. Means for detecting or anticipating operational troubles
4. Development of a comprehensive maintenance program
5. Development of an educational and training program to assure proper use and repair of facilities

While the committee's investigations have not been concluded, preliminary studies have eliminated several operating problems, brought to light operating hazards, and have resulted in an accumulation of factual information of great value in the overall administration of research programs involving use of refrigerated facilities. (W)

35. Property Management and Utilization

Early in the spring of 1953, a special property utilization survey was made of the entire grounds and buildings. This survey included both supplies, equipment and space utilization and was made by a committee of three staff members experienced in chemical, mechanical and pilot plant, laboratory, and maintenance supplies, standards, etc. Valuable recommendations were made regarding housekeeping and management of our laboratories and outside buildings, with respect to utilization and storage of supplies, equipment, etc. Some of them have already been put into practice. For example: (1) Divisions have

turned back to the Storerooms those excess items of storeroom stock items, both opened and unopened packages for reissue. (2) Chemicals and other supplies which we have to keep available in individual laboratories were inventoried and reported to Purchase and Property on card record for use in making these supplies readily available throughout the laboratory. Incoming requisitions are checked with this record to determine whether supplies are available in the quantity needed. (3) As a direct result of the survey, many old, worn out, and obsolete items of supply and equipment were carefully inspected by members of the staff, and the Laboratory Survey Board to determine whether their value would warrant declaring them surplus or scrapping them. Several of the larger pieces of equipment were sold as used equipment. Those determined to have scrap value only were checked for any possible salvage, and the rest sold as scrap. Other items picked up were tested and repaired by our shops and were put back into use, or made available as standby supplies for future use.

From the sale of used equipment, we realized $2,200. From the sale of scrap, $566. (N)

36. Device for Coordinating Pilot Plant Activity in Hazardous Area

In the pilot-plant area of the Southern Laboratory flammable solvents, which present a hazard, are constantly used. Mechanics of the Mechanical Service Division are frequently engaged in assembling and fabricating of pilot plant equipment in this area. The mechanics are not permitted to work in the hazardous area when flammable solvents are being used. Much time has been required in the past to coordinate the safe use of flammable solvents with such construction and maintenance activities.

In order to coordinate research and shop work in the hazardous pilot plant area a metal flag has been installed on the south side stairs to indicate danger when flammable solvents are being used. The metal flag is painted yellow and the words "Danger Flammable Solvents" are painted in red on both sides of the flag. This metal flag is so constructed that it can be concealed when shop work is to be carried out in the hazardous area and displayed when flammable solvents are being used. This simple device eliminates any confusion as to when shop work can be safely performed in the hazardous pilot plant area. Operation of the metal flag in the pilot plant area for the past three years has saved much time and has eliminated hazardous working conditions. (S)

37. Food Dehydration Pilot Plant Constructed at Low Cost

In connection with conducting experimental studies of raw materials for dehydration of sweetpotatoes, a pilot plant in which commercial practice could be simulated was needed.

A dehydration pilot plant, consisting of (1) batch preheater,

(2) rotary lye peeler, (3) rotary water washer, (4) manually operated dicing machine, (5) batch blancher, (6) batch spray unit for applying sulfite solution or coating of starch or other material to the blanched, diced sweetpotatoes, and (7) tray, forced-draft oven equipped with wet-dry bulb recorder and with auxiliary damper and air supply system, making it possible to vary air-flow and percentage of air recirculated, has been constructed and successfully operated. The construction of this plant makes it possible for the laboratory to dehydrate 100 pound batches of sweetpotatoes per run and to provide sufficient dehydrated product for storage and taste panel evaluation. This plant was constructed by the Laboratory shop largely from equipment and supplies on hand, for example, dismantling of protein fiber pilot plant and using equipment and materials for essential parts of the dehydration plant. New equipment and supplies purchased amounted to less than $500, and equipment and supplies reused probably had a depreciated value of less than $1000. If everything had been obtained on contract, using new equipment, the plant would have cost about $3,000. (S)

E. Records Management:

38. Revision of the File System

The recodification of the Northern Regional Research Laboratory files according to a revised classification of research and administrative subjects, was completed this year. Approximately 650,000 pieces of correspondence have been reviewed, recoded, and refiled in the correspondence file alone. A total of 514 linear feet of material has been destroyed, including duplicate copies, routine material of no value, files for which disposal had not been set up previously, and, of course, the files which were already scheduled for disposal.

With the inauguration of a card index file we were able to discard the "reader" copy file which occupied fifty-five feet of floor space. Another aid in locating correspondence is a complete cross index to the new codification outline containing 3083 references to the file. The new codification system is both alphabetic and numeric so that subjects can be added at any time and always fall in the proper place alphabetically on the outline. (N)

39. Disposal of Obsolete Records

The intensive program of reviewing and disposing of obsolete records was continued this year. A total of 20 feet of filing space was salvaged in the Bookkeeping Section through the inauguration of a disposal system. Personnel Section purged the files of former employees in preparation for shipping them to the Placement Center with a total saving of nine cubic feet of filing space. The Audit Section released to the Central Files a total of 11 drawers of filing material resulting in overall economy of man hours of filing time

as it can be done more economically in Central Files than by the Audit Section. (N)

F. Fiscal Operations:

40. Decentralization of General Ledger Records

Intensive work continued during the fiscal year 1953 in connection with the program begun in the fiscal year 1952 for improving the accounting operations of the Bureau. Decentralization of the general ledger records to the four regional research laboratories was accomplished and a new accounting manual was prepared and is now being used throughout the Bureau. The new accounting manual, in addition to containing operating procedures and instructions for accounting and financial reporting, also includes such sections as the Bureau policy on administrative control under apportionments, organization charts, denoting lines of authority in conjunction with fiscal operations, historical background of the Bureau, and a statement on accounting principles. (Washington)

G. Improved Organization for More Effective Research Administration

41. Research Line Project System

Beginning in November, 1951, extensive changes were instituted in the method of preparing research line projects, the basic technical documents wherein particular phases of the research program are outlined and are formally authorized by the Chief of Bureau. The changes were designed to make line projects more specific and more current as concerns the importance of problems and the approach to their solution, and generally more informative than had previously been the case.

To serve as a basis for the new system, there was prepared and issued a Guide for Line Project Preparation, the objective of which is "to show project writers what is necessary in order that (1) the relative importance of the line project can be properly evaluated before it is approved by the Chief of Bureau; (2) the whole body of active line projects can be readily coordinated at the Bureau level; (3) the body of line projects, taken in conjunction with the work project annual reports, will furnish a clear, current picture of the Bureau's activities; and (4) the line project can be used by administrators as an adequate basis for justifying the Bureau's program before appropriations hearings, and elsewhere."

Line projects active in November, 1951, were revised, or were discontinued in favor of new lines of work. Project durations were generally limited to two years instead of the five years that had previously been customary. The actual submission of revised projects was begun in June, 1952; and as of August, 1953, the job of processing them had been virtually completed.

The revised or new projects involved in the Project Revision operation, together with new projects subsequently set up, number about 400 in all. (Washington)

42. Commodity Conferences

During the fiscal year the Bureau held many group meetings and formal conferences to exchange ideas and information with other research workers, farmers and processors as a device for assuring that the Bureau's research programs are in consonance with the needs. For instance, during the latter part of the fiscal year 1953 two highly important commodity conferences, sponsored by the Bureau, were held in Washington, D. C., one concerned with Fruits and Vegetables, the other with Fats and Oils. Both conferences were attended by the top planning staff of the Bureau and experts in various research fields both of this organization and other bureaus and agencies of the Department as well as representatives of industry. These conferences have provided a convenient, economical, and worthwhile method of obtaining, in a short space of a few days, a comprehensive, well coordinated view of the national situation with respect to these commodities and the reports of these conferences will provide a basis for planning research programs of the Bureau. (Washington)

43. Consolidation of Fruit and Vegetable Research Activities

The report for fiscal year 1952, included the above item showing improvements anticipated as a result of the consolidation of the fruit and vegetable work into one research division. The new division was named Fruit and Vegetable Division. This report indicates the improvements actually realized as a result of this consolidation of the work.

This reorganization along commodity lines gives a general increase in efficiency of operation. The consolidation of technical personnel of varied experience and training but with broad objectives in common permits more effective use of these scientists. Programs have been initiated to acquaint all Division personnel with every project under current investigation in the Division. This will provide each worker with a general appreciation of the problems and technology of the food processing industry. It will also provide each research worker with an understanding of the scientific problems of his associates, why they are important, how they are being attacked, and a general appreciation of progress being made. Furthermore, this close association with fellow workers provides an opportunity for exchange of scientific information and knowledge and facilitates on-the-job training.

Increased efficiency in the use of equipment, which in actuality is an integral part of personnel efficiency, was also achieved through this reorganization. Equipment items such as cold storage rooms, grinders, slicers, drying ovens, cookers, centrifuges, presses, colorimeters, etc., are prerequisites for most fruit and vegetable research projects. The concentration in one Division of personnel having a common interest in

these necessary items insures maximum use of equipment with attendant saving of time and money.

The gathering and dissemination of technical information has also been facilitated by the consolidation in one Division of laboratory research work on fruits, potatoes, and other vegetables of the Eastern Region. Contacts with the food processing industry, by trips to industrial plants or technical meetings, visits of industrialists to this Laboratory, or by correspondence are more efficiently handled because of the concentration of food research work resulting from the above cited reorganization.

Specific examples of increased economy of time and personnel are already in evidence at the project working level. For example, research is in progress on the amino acid constituents of fruits, potatoes and other vegetables of the Eastern Region in three different sections of the newly created Division. In one of these Sections an experienced research worker is now developing a new method of analysis which will be helpful to work in the other two Sections which were formerly outside of the present Division. Similarly, experience with the preparation and stabilization of potato chips and potato chip bars has been of value to more recent work on deep fat fried vegetable chips.

In summary, the concentration of laboratory research on fruits, potatoes, and other vegetables of the Eastern Region in one Division has effected economies in operation at both the administrative and technical research levels. (E)

44. Reorganization of Protein Research Program

Due to the successful conclusion of some portions of the protein research program and to other factors affecting this work it became necessary to reorganize the Protein Division.

The reorganization resulted in the establishment of the Animal Proteins Division and permitted us to emphasize important phases of our protein research program. It involved the transfer of personnel to fundamental work and the strengthening of our research on protein structure. The result has been more effective use of scientific personnel and increased efficiency. (E)

45. Reorganization for More Effective Administration

Although a material reorganization of the Bureau's Western Regional Research Laboratory was made as recently as 1949, several changes subsequently occurred which caused the Laboratory to be in unbalance from the standpoint of divisional organization. Appropriations in 1951, 1952 and 1953 were successively reduced in substantial amounts. The legislative decision to conduct work of an approximate annual rate of $111,000 by contract, operated to further reduce resources for work by

the actual staff of the Laboratory. The changing international situation as well as changes in emphasis resulting from recommendations of the various advisory committees appointed in furtherance of the Research and Marketing Act of 1946 contributed to a general condition of unbalance.

In September 1952, the Bureau secured approval for a major reorganization of the Western Regional Research Laboratory. The basic principle of the reorganization was that each division should cover a homogeneous subject matter field. In this reorganization, work on Enzymology, formerly conducted by an Enzyme Division, was divided and placed in appropriate commodity divisions. Research on fruit and vegetable waste and by-products, formerly carried on in a Biochemical Division, was similarly divided and placed in the existing Fruit and Vegetable Processing Divisions. All work on field crops was drawn together and placed in a single new division. The changes substantially contributed to more effective research and to some extent offset the loss in manpower which had compelled the changes. (W)